

for Automotive Electronics

SPECIFICATIONS

| | |
|-----------------------------|--|
| Customer | |
| Product Name | Assembled Wire Wound Power Inductor for Automotive Electronics |
| Sunlord Part Number | AMWPQ3316 Series |
| Customer Part Number | |
| Weight | 65.90 g /pcs Typ. |

New Released, Revised]

SPEC No.: AMWPQ0201220000

【This SPEC is total 11 pages.】

【RoHS Compliant Parts】

| Approved By | Checked By | Issued By |
|-------------|------------|-----------|
| / | / | / |

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Qualification Status: Full Restricted Rejected

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|-------------|-------------|---------------|------------|
| | | | |

Comments:

Version Change History

| Rev. | Date | Item | Changed Contents | Change Reasons | Drawing | Check | Approval |
|------|------|------|------------------|----------------|---------------|---------|----------|
| 01 | / | / | / | New release | Zhenjian Yang | Yubo Su | Yubo Su |
| | | | | | | | |

for Automotive Electronics

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for Automotive Electronics

1 Scope

1.1 Scope of parts

This specification applies to the AMWPQ3316 series assembled wire wound power inductor for Automotive Electronics based on AECQ200.

1.2 Scope of application

Product numbers recorded in this specification are used in automotive applications.

1.3 Operating and storage temperature

The part temperature (ambient + temp. rise) should not exceed 125 °C under worst case operating conditions. Circuit design, component placement, PCB trace size and thickness, airflow and other cooling provisions all affect the part temperature. Part temperature should be verified in the end application.

- 1) Operating and storage temperature range (individual chip without packing): -40°C ~ +125°C (including temperature rise).
- 2) Storage temperature range (packaging conditions): -10°C~+40°C and RH 70% (Max.).

1.4 MSL: level1.

2 Product Description and Identification (Part Number)

1) Description:

AMWPQ3316 series of assembled wire wound power inductor for Automotive Electronics.

2) Product Identification (Part Number)

| | | | | | | |
|-----------------------------------|---------------------------------|---|-----|---|---|-----|
| AMWPQ | 3316 | T | 4R7 | K | P | □□□ |
| ① | ② | ③ | ④ | ⑤ | ⑥ | ⑦ |
| ① Product Type | AMWPQ: Assembled Power Inductor | | | | | |
| ② External Dimensions(L×W×H) [mm] | 3316: 33×33×16 mm | | | | | |
| ③ Feature type | T : T Type material | | | | | |
| ④ Nominal Inductance | 3R3:3.3uH, 4R7:4.7uH | | | | | |
| ⑤ Inductance Tolerance | K: ±10%, M: ±20% | | | | | |
| ⑥ Packing | T--Taping, P--Pallet, B—Bulk | | | | | |
| ⑦ Special Process code | Standard product is blank | | | | | |

3 Shape and Dimensions

3.1 Dimensions , please see Fig.3-1, Fig. 3-2, Fig. 3-3 and Table 3-1.

3.2 Recommended PCB pattern, please see Fig. 3-4 and Table 3-1.

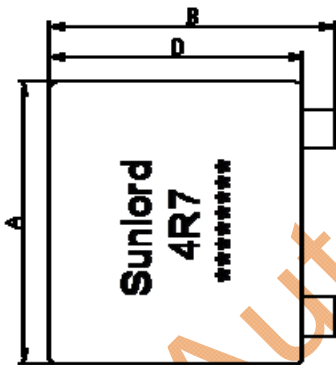


Fig.3-1

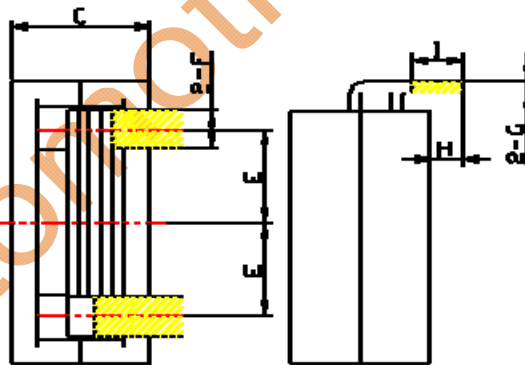


Fig.3-2

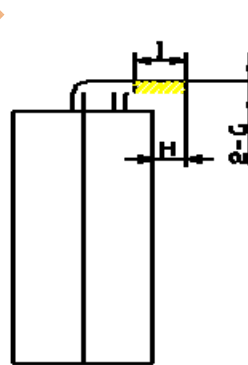


Fig.3-3

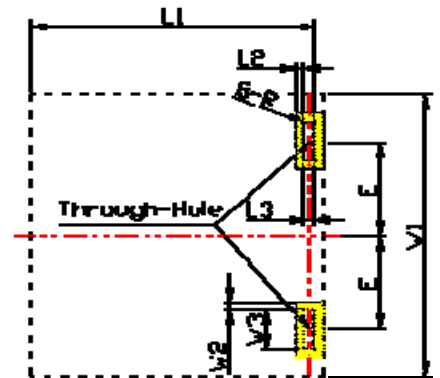


Fig.3-4

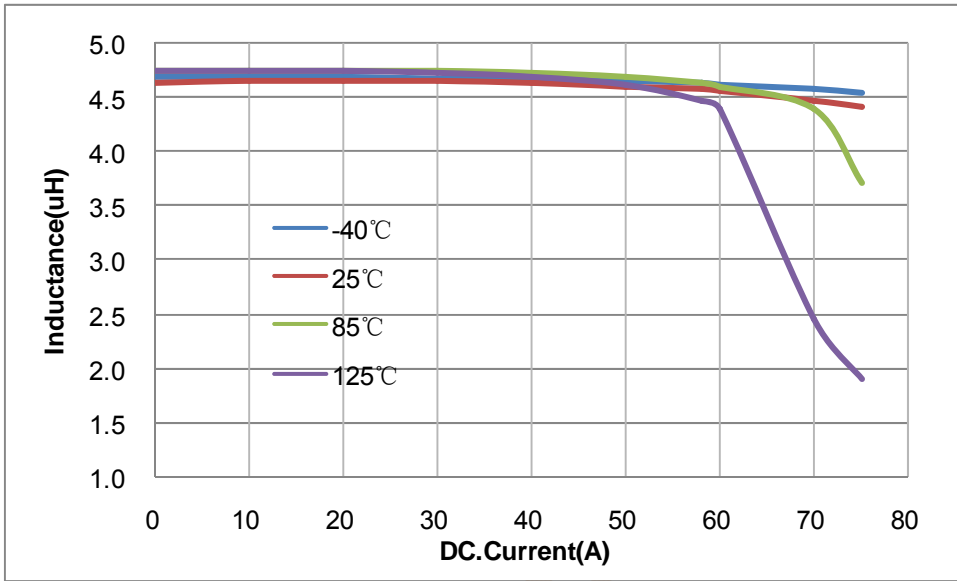
[Table 3-1] (Unit:mm)

| Series | A | B | C | D | E | F | G | H | I |
|-----------|---------|--------|----------|----------|----------|-------------------|-----------|---------|-------|
| AMWPQ3316 | 33±1.0 | 33±1.0 | 16±0.4 | 29.8 max | 10.9±0.5 | 4.4 +0.15/-0.4 | 1.25±0.15 | 3.5±0.5 | 4 min |
| Series | L1 | L2 | L3 | W1 | W2 | W3 | R | | |
| AMWPQ3316 | 34.7ref | 1.0ref | 1.75±0.2 | 36ref | 1.0ref | 5.5±0.1 | 0.2ref | | |

4 Electrical Characteristics

| Part Number | Inductance | DCR | Saturation Current | | Heat Rating Current | | Marking |
|-----------------|-------------|-----------|--------------------|------|---------------------|------|-----------------|
| | 100KHz/0.1V | | Max. | Typ. | Max. | Typ. | |
| Units | μH | mΩ | A | | A | | |
| Symbol | L | DCR | Isat(-30%) | | Irms | | - |
| AMWPQ3316T3R3KP | 3.3 ± 10% | 1.2 ± 10% | 100 | >100 | 50 | 53 | Refer to Item 7 |
| AMWPQ3316T4R7KP | 4.7 ± 10% | 1.2 ± 10% | 70 | 73 | 50 | 53 | |

Appendix: Typical Electrical Characteristics Curve



5 Test and Measurement Procedures

5.1 Test Conditions

5.1.1 Unless otherwise specified, the standard atmospheric conditions for measurement/test as:

- a. Ambient Temperature: $20 \pm 15^{\circ}\text{C}$.
- b. Relative Humidity: $65 \pm 20\%$.
- c. Air Pressure: 86kPa to 106kPa.

5.1.2 If any doubt on the results, measurements/tests should be made within the following limits:

- a. Ambient Temperature: $20 \pm 2^{\circ}\text{C}$.
- b. Relative Humidity: $65 \pm 5\%$.
- c. Air Pressure: 86kPa to 106kPa.

5.2 Visual Examination: visual inspection.

5.3 Electrical Test

5.3.1 Inductance (L)

- a. Refer to **Item 4**. Test equipment: WK3260B LCR meter or equivalent.
- b. Test Frequency and Voltage: refers to **Item 4**.

5.3.2 Direct Current Resistance (DCR)

- a. Refer to **Item 4**.
- b. Test equipment: HIOKI 3540 or equivalent.

5.3.3 Saturation Current (Isat)

- a. Refer to **Item 4**.
- b. Test equipment: WK3260B LCR meter or equivalent.

5.3.4 Temperature rise current (Irms)

- a. Refer to **Item 4**.
- b. Test equipment (see Fig. 5.3.4-1, Fig.5.3.4-2): Electric Power, Electric current meter, Thermometer.
- c. Measurement method:
 1. Set test current to be 0 mA.
 2. Measure initial temperature of choke surface.
 3. Gradually increase current and measure choke temperature for corresponding current.
 4. Definition of Temperature rise current: DC current that causes the temperature rise (ΔT) from ambient temperature.

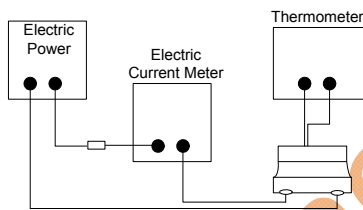


Fig. 5.3.4-1

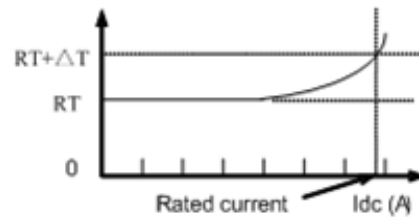


Fig. 5.3.4-2

5.3.5 Self-resonant frequency (SRF)

- a. Refer to **Item 4**.
- b. Test equipment: Agilent E4991A+16197 or equivalent.

6 Structure and material list

The structure and material list of AMWPQ3316 products, please refer to Fig.6-1 and Table 6-1.

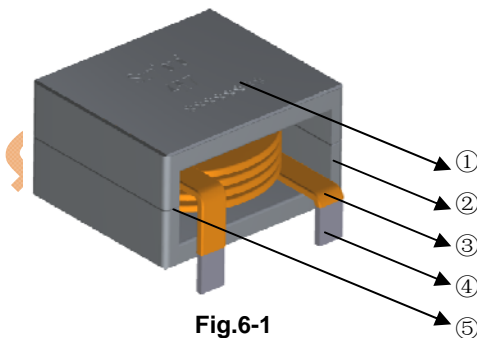


Fig.6-1

[Table.6-1]

| No. | Components | Material |
|-----|------------|--|
| ① | Making | Laser marking |
| ② | Core | Mn-Zn ferrite core |
| ③ | Coil | Flat Wire , Polyurethane system enameled copper wire |
| ④ | Electrode | Sn alloy |
| ⑤ | Binder | Epoxy resin |

7 Product Marking

The product marking (please see Fig.7-1):

Sunlord : Manufacturer

4R7 : Inductance of the products

XXXXXXXX: Trace code

Fig.7-1

8 Reliability Test

| No. | Test Item | Test Method(According to AEC-Q200) | Requirements |
|-----|--------------------------------|---|--|
| 1 | Terminal Strength | Reflow 3 times,40N, 8±2s | No visible mechanical damage. |
| 2 | Resistance to Flexure | Reflow 3 times,2mm,60(+5)s. | No visible mechanical damage. |
| 3 | Temp. Characteristics | +25°C/15(+3)min →-40°C/15(+3)min →+125°C/15(+3)min. | Inductance change should be within ±10% of reference value measuring at 25°C |
| 4 | Solderability | ①Steam aging 8h±15 min ②235°C, 5+0/-0.5s, 25±6 mm/s, depth: tin surface is 1.25mm from the component body; ③welding material: Sn/ 3.0Ag/0.5Cu; | (1) No visible mechanical damage; (2) Wetting shall be exceeded 95% Coverage. |
| 5 | Resistance to Soldering Heat | Reflow: Max. 260°C/10s,3 times; Solder:Sn/3.0Ag/0.5Cu. | |
| 6 | High Frequency Vibration | 10~2000~10Hz,5g,20min/Cycle,4hours in each 3 mutually perpendicular directions (total of 12hours). | |
| 7 | Mechanical Shock | Half sine shock pulse,100g,6ms,6 shocks in each 3 mutually perpendicular directions (total of 18 shocks). | |
| 8 | Loading Under High temperature | Reflow 3 times,85±2°C,1000(+24)hours, rated current. | |
| 9 | Thermal Shock | Reflow 3times, -40°C/ (30±3min), +125°C/(30±3min), transforming interval:20s,1000cycles. | |
| 10 | Resistance to Low Temperature | Reflow 3 times,-40°C±2°C, 1000(+24) hours. | (1) No visible mechanical damage; |
| 11 | Resistance to High Temperature | Reflow 3 times,125°C±2°C,1000(+24)hours. | (2) Inductance change: Within ±10%. |
| 12 | Moisture Resistance | Reflow 3 times: ① 25±2°C→65±2°C,90%~100%RH,2.5h; ② 65±2°C,90%~100%RH,3h; ③ 65±2°C→25 (+10,-2) °C,80%~100%RH,2.5h; ④ 25°C→65±2°C,90%~100%RH,2.5h; ⑤ 65±2°C,90%~100%RH,3h; ⑥ 65±2°C→25±2°C,80%~100%RH,2.5h; ⑦ 25±2°C,90%~100%RH,8h,24hours of 1cycle(total of240 hours). | |
| 13 | Biased Humidity | Reflow 3 times,85°C, 85%RH,1000(+24) h. | (1) No visible mechanical damage; (2) Inductance change: Within ±10%. |

| | | | |
|----|--------------------|---|--|
| 14 | MSL | Team A: ①Pre- and Post- Stress Electrical and Visual Test ; ②High temperature Bake:125+5/-0°C,24 h; ③Temperature& Humidity Soak:85°C,85%RH,168 h; ④Ref low:MAX.260°C/10 s, 3 times. | (1) No visible mechanical damage (2) Inductance change: Within $\pm 10\%$ |
| 15 | Flammability | Refer to MIL-STD-202 Method 111、 Refer to UL94. | ① t1 or t2: $\leq 10s$; ② t1 plus t2 for the 5 specimens: $\leq 50s$; ③ t2+t3 for each specimen: $\leq 30s$; ④No after-flame or after-glow of any specimen up to the holding clamp; ⑤No cotton indicator ignited by flaming particles or drops. |
| 16 | ESD Test | HBM ESD discharge waveform,8KV,each 1 time of +/- polarity. | (1) No visible mechanical damage (2) Inductance change: Within $\pm 10\%$ (3) DCR: Satisfy electrical characteristic. |
| 17 | Solvent resistance | Add Aqueous wash chemical. OKEM Clean or equivalent. Do not use banned solvents. | ① No specified markings which are missing in whole or in part, faded, smeared, blurred, or shifted (dislodged) to the extent ; ② No specimen shall have cracks, separations, crazing, swelling, softening, and degradation of body material, end caps and seals if present. |

9 Packaging and Storage

9.1 Packaging

Outer case cases (see Fig. 9.1.1):
Size: 380*260*200mm

9.2 Packing Documents and Marking

9.2.1 Packing Documents

Packing documents include the following:

- 1) Packaging list;
- 2) Certificate of compliance (COC).

9.2.2 Packing QTY.

- 20 pcs in each pallet.
- 80 pcs in each outer case.

9.2.3 Marking

1) Marking label information on inner case includes (see Fig. 9.2.3-1):

Fig.9.2.3-1: Shipping labels

- a). P/O No.
- b). Customer Part No.
- c). Sunlord Part No.
- d). Quantity.
- e). Lot No.
- f). Date code.
- g). Inspection stamp.
- h). MFG address as 'Made In China'.



Fig.9.1.1(Outer case)

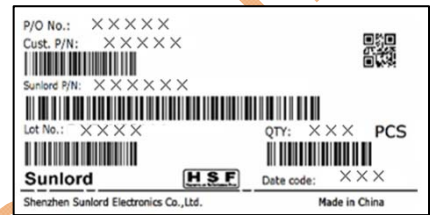


Fig.9.2.3-1

2) Marking on outer case (see Fig.9.2.3-2-4):

- a). Manufacturer: Sunlord ID: "Shenzhen Sunlord Electronics Co., Ltd."
- b). Packing label include the following:
 - i) Customer.
 - ii) Manufacturer.
 - iii) Date code.
 - iv) C/No.
 - v) P/O No.
 - vi) Customer Part No.
 - vii) Sunlord Part No.
 - viii) Quantity.
 - ix) Inspection Stamp.

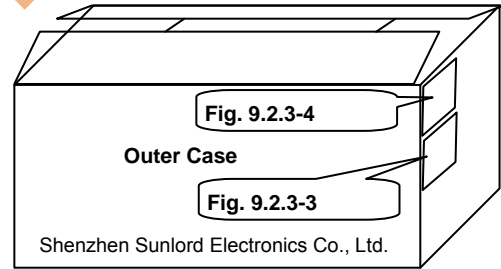


Fig. 9.2.3-2

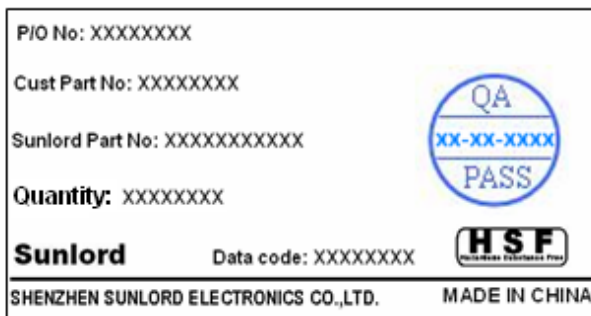


Fig.9.2.3-3

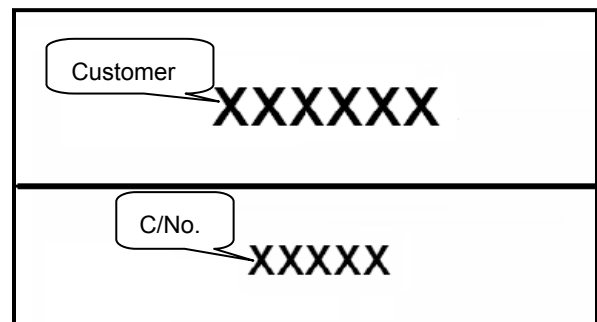
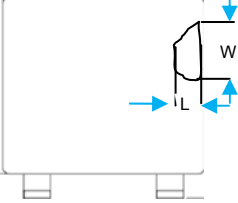


Fig.9.2.3-4

10 Visual inspection standard of product

| File No: | | Applied to Assembled Wire Wound Power Inductor for Automotive Electronics | | REV:01 |
|-----------------|-------------|---|--|------------|
| Effective date: | | | | |
| No. | Defect Item | Graphic | Rejection identification | Acceptance |
| 1 | Core defect |  | The defect length/width (L and W) more than 3mm, NG. | AQL=0.065 |

11 Recommended Soldering Technologies (please refer to Fig. 11-1 and Table 11-1):

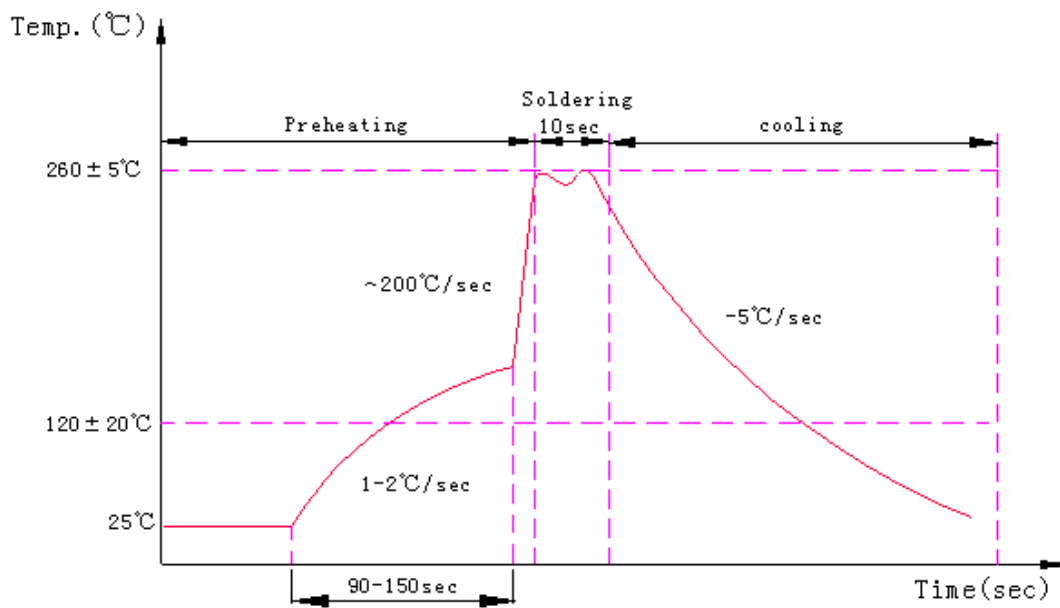


Fig. 11-1

[Table.11-1]

| Profile feature | Time | Temperature |
|-----------------------------|------------|-------------|
| Preheating time | 90~150 sec | |
| Heating rate during preheat | | 1~2°C/ sec |
| Final preheat temperature | | 120±20°C |
| Ramp-up rate | | ~200°C/ sec |
| Dip time and temperature | 2.5~5 sec | 260±5°C |
| Ramp-down rate | | ~5/ sec |

12 Precautions

12.1 Surface mounting

- Mounting and soldering condition should be checked beforehand.
- Applicable soldering process to this product is reflow soldering only.
- Recommended conditions for repair by soldering iron:
Preheat the circuit board with product to repair at 150°C for about 1 minute.
Put soldering iron on the land-pattern.
Soldering iron's temperature: 350°C maximum/Duration: 3 seconds maximum/1 time for each terminal.
The soldering iron should not directly touch the inductor.
Product once removes from the circuit board may not be used again.

12.2 Handling

- Keep the products away from all magnets and magnetic objects.
- Be careful not to subject the products to excessive mechanical shocks.
- Please avoid applying impact to the products after mounted on pc board.
- Avoid ultrasonic cleaning.

12.3 Storage

- To maintain the solderability of terminal electrodes and to keep the packing material in good condition, temperature and humidity in the storage area should be controlled.
- Recommended conditions: -10°C~40°C, 70%RH (Max.).
- Even under ideal storage conditions, solderability of products electrodes may decrease as time passes. For this reason, product should be used with one year from the time of delivery.
- In case of storage over 6 months, solderability shall be checked before actual usage.

12.4 Regarding Regulations

- Any Class- I or Class- II ozone-depleting substance (ODS) listed in the Clean Air Act in US for regulation is not included in the products or applied to the products at any stage of whose manufacturing processes.
- Certain brominated flame retardants (PBBs, PBDEs) are not used at all.
- The products of this specification are not subject to the Export Trade Control Order in China or the Export Administration Regulations in US.

12.5 Guarantee

- The guaranteed operating conditions of the products are in accordance with the conditions specified in this specification.
- Please note that Sunlord takes no responsibility for any failure and/or abnormality which is caused by use under other than the aforesaid operating conditions.

12.6 Please make sure to record the lot number on the label when using Sunlord's products in order for good traceability.